



Title of Investigation:

Revision and Implementation of NYCRI NASA GISS Learning Units and Courses

Principal Investigator:

Dr. Frank Scalzo (Code 130)

Other In-house Members of Team:

Leslie Mc Cathy (Code 100)

Other External Collaborators:

Dr. Shermane Austin (Medgar Evers College/CUNY); Dr. Paul Marchese (Queensborough Community College/CUNY); Dr. George Tselioudis (GISS/Columbia University researcher); Donald Overly (NYCDE); Dr. Mark Chandler (GISS/Columbia University researcher)

Initiation Year:

FY 2005

Funding Authorized for FY 2005:

\$20,000

Actual or Expected Expenditure of FY 2005 Funding:

\$ 3,500 to Dr. Austin; \$3,500 to Dr. Marchese; \$3,900 to Dr. Tselioudis; \$2,500 to Mr. Overly; and \$6,600 to Dr. Chandler

Status of Investigation at End of FY 2005:

Continue to formulate and implement NASA research-based learning units and courses, submit these products for review, and implement them at institutions in the New York metropolitan area.

Expected Completion Date:

December 2006

DDF annual report

Purpose of Investigation:

The primary purpose of the investigation was to formulate, implement, and evaluate NASA research-based Earth science learning units for middle school, high school, and university campuses throughout the New York Metropolitan area. Second, we wanted to help implement these learning units developed by scientists at the Goddard Institute for Space Studies (GISS) and research faculty at the New York City Research Initiative (NYCRI). And third, we wanted to implement two Earth science teacher preparation/enhancement courses at NASA GISS and/or The City College of New York. The plan included implementing the courses at other City University of New York campuses as well as at NYCRI partner campuses in New Jersey and Connecticut.

Accomplishments to Date:

Dr. Mark Chandler revised his EdGCM (PC version of the GISS Global Climate Model (GCM)) for use in middle school classrooms (initially at the NYC NASA Explorer Schools (NES)). Also, he presented EdGCM workshops to schools districts in Wisconsin and New York, as well as to NASA Aerospace Education Specialists (AESPs), and at a Goddard Space Flight Center Education and Outreach Colloquium.

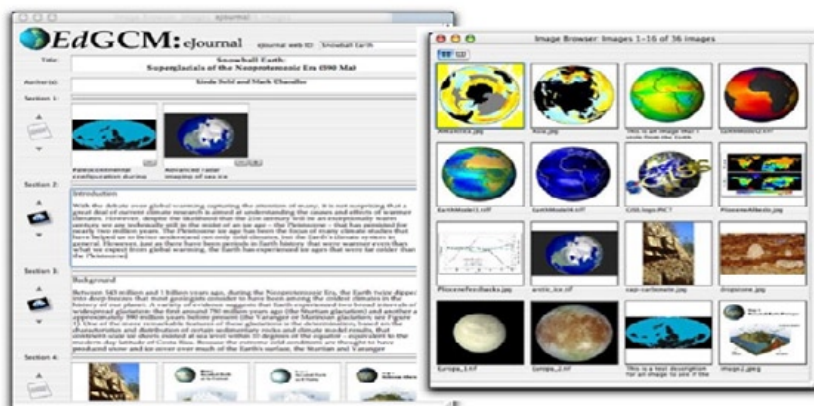


Figure 1. Sample EdGCM classroom worksheet/journal

Dr. Paul Marchese developed several hands-on interactive learning units for use in NES classrooms:

- **How do we calculate the mass of a planet?** looks at the relationship between centripetal force and other external forces to calculate the mass of different objects in the solar system.
- **What is density?** shows students how to determine the density of different objects. Planetary density investigates the density of a planet and discusses what density tells us about planets.
- **Magnets and magnetic fields** shows students how do we create a magnet. It also explains magnetic fields and their effect on charged particles.
- **Planetary magnetic fields** investigates the magnetic fields of different planets, explaining what magnetic fields can tell us about the interior of the planet and what effect they have on the surface of the planet.
- **The Sun and the solar wind** investigates the Sun and solar wind, answering how solar wind affects various planets.

Dr. Shermane Austin developed several hands-on interactive learning units as well:

- **Design a Mission to Space (Grades K-12)** is an inquiry-based project activity that incorporates such concepts as scientific method, weather-related topics (atmospheric layers, pressure, temperature variations), GPS and tracking, balloon flight, and free lift. The associated flight vehicle ascends to heights of more than 100,000 feet where pressure is similar to the surface pressure on Mars and student projects/ideas may explore either Mars or Earth-based investigations.
- **Introduction to Remote Sensing (Grades 8-12)** is a research-based project using CricketSATs and moored balloons to explore areas related to remote sensing. It includes simple instrumentation using light, temperature, humidity, pressure, sensors, data calibration, acquisition and retrieval, and imaging.

Don Overly helped GISS Scientist Dorothy Peteet to revise and implement the GISS **Carbon Question Course (15 hours/1 new teacher credit), which was given to NYC teachers at GISS**. This course is a multi-year research collaboration involving NASA scientists, science teachers, and high school and college students. The curriculum for this course is driven by authentic science questions and topics related to problems, such as carbon storage and climate change. Participants applied fundamental concepts in biology and actual research methods, including experimentation, field observations (virtual and on-site), mathematical modeling, and data analysis to investigate human and natural components of terrestrial ecosystems.

Dr. George Tselioudis, NASA GISS Columbia University researcher, revised a course entitled, “Mathematical Modeling: What Determines a Planet’s Climate,” based on reviewer comments. He managed a three-person team that made all the required revisions, including the necessary corrections to the Radiation Balance Model, and then resubmitted this course to NASA Earth Science Enterprise (ESE) reviewers. On November 30, 2005, we were notified that this course passed ESE product review at the Institute of Global Environment Society (IGES) and is recommended for distribution via a teachers’ workshop. In fact, this course will be included in a NASA teacher workshop, which will be held during the week of Feb. 14 at the Johnson Space Center.

Publications and Conference Presentations:

- Resulting products presented at the NASA, National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), United States Department of Education (USDE), and Department of Defense (DOD) Research Summit, which was held on July 12, 2005 at Stevens Institute of Technology, which is the lead institution for the New Jersey Space Grant Consortium.
- The Carbon Question Course was offered for new-teacher credit on September 26, 28 and October 12, 17 at NASA GISS. This course will be offered for graduate credit at The City College of New York during the 2006–2007 academic year.
- The Mathematic Modeling: What Determines a Planet’s Climate” course will be offered as a NASA teacher workshop at JSC on February 14, 2006.
- The EdGCM was offered to GSFC NES teams, AESPs and scientists during 2005 summer training sessions and at a GSFC Education and Outreach Colloquium.

Planned Future Work:

We plan to submit each of the FY 2005 products listed above to NASA ESE product review and then implement them in GSFC-NYCRI partner high schools and colleges in New York, New Jersey, and Connecticut. In FY 2006, we plan to continue with the formulation, implementation, and evaluation of NASA research-based learning units and courses at NES schools and NYCRI partner high schools, colleges, and universities.

Key Points Summary:

Project's innovative features: This project provided a vehicle for disseminating NASA research-based learning units and courses developed over a 10-year period.

Potential payoff to Goddard/NASA: Use of the NASA research-based learning units and the EdGCM program at three New York NES schools benefits NASA. So does the development of new research-based university courses. Both disseminate NASA's Global Climate Model and Climate Variability Studies nationally, using both formal and formal educational venues.

The criteria for success: We will consider our efforts successful if the programs are disseminated locally and nationally.

Technical risk factors: Risk factors include failing to find a dissemination vehicle for NASA research in 6-12 and the university courses.